

**ANDHRA UNIVERSITY  
DEPARTMENT OF GEOLOGY  
COLLEGE OF SCIENCE AND TECHNOLOGY**

**Scheme of Instruction and Examinations  
M. S. GEOLOGY (5 YEAR INTEGRATED COURSE (VII-SEMESTER))  
(With effect from the admitted batch 2008-2013)**

**M.S. GEOLOGY (5 YEAR INTEGRATED COURSE)**

Scheme of Instruction and Examinations

(With effect from the admitted batch of 2008-2013)

**VII - SEMESTER**

S. No	Course	Teaching/Lab Hours Per week	Duration of Examination hours	Allotment of Marks		Total Marks	Subject Credits
				External	Internal (Sessionals)		
01	Paper-I Mineralogy	3	3	85	15	100	4
02	Paper-II Igneous and Metamorphic Petrology	3	3	85	15	100	4
03	Paper-III Structural Geology & Tectonics	3	3	85	15	100	4
04	Paper-IV Stratigraphy & Micropaleontology	3	3	85	15	100	4
05	Paper-I Mineralogy	4	3	50	-	50	2
06	Paper-II Igneous and Metamorphic Petrology	4	3	50	-	50	2
07	Paper-III Structural Geology & Tectonics	4	3	50	-	50	2
08	Paper-IV Stratigraphy & Micropaleontology	4	3	50	-	50	2
09	Field Work	-	-	-	-	50	2
10.	Viva Voice	-	-	-	-	50	2
<b>TOTAL</b>						<b>700</b>	<b>28</b>

## **SYLLABUS**

### **M.S. GEOLOGY (5 YEAR INTEGRATED COURSE)**

#### **PAPER- I, MINERALOGY**

#### **VII - SEMESTER**

##### **UNIT –I**

Introduction to Minerals. Classification of silicate minerals. Structure, chemistry, physical and optical properties of (a) Olivine Group (b) Garnet Group (c) Epidote Group (d) Aluminosilicate Group

##### **UNIT –II**

Structure, chemistry, physical and optical properties of (a) Pyroxene Group (b) Amphiboles Group (c) Clay minerals (d). Mica Group.

##### **UNIT –III**

Isomorphism, Polymorphism. Structure, chemistry, physical and optical properties of (a) Feldspathoids Group (b) Feldspars and (c) silica minerals

##### **UNIT – IV**

Classification of nonsilicates; chemistry and paragenesis of Native elements, Oxides and Sulphides.

#### **ASSIGNMENTS**

Chemistry and paragenesis of Carbonates, phosphates, Halides, Sulphates, Gemstones and Semi precious stones.

#### **PRACTICALS:**

- a) Megascopic and microscopic identification of important silicate and nonsilicate minerals.
- b) Calculation of Mineral formula
- c) Interpretation of X-ray diffractograms of common minerals and D.T.A curves.
- d) SEM photographs

**(P.T.O)**

**TEXT BOOKS:**

An Introduction to the rock forming minerals by **W.A.Deer, R.A. Howie and J. Zussman**

Dana's Text book of Mineralogy by **W.E. Ford**

Manual of Mineralogy by **Klein, C. and Hurlbut, Jr.C.S**

Descriptive Mineralogy by **L.G. Berry and Mason.**

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**Model Question Paper**  
**Mineralogy, VII - Semester**  
**M.S. Geology (5 Year Integrated Course), Paper - I**  
(Effective from the Admitted Batch of 2011-2012)

**Time: 3Hrs**

**Max. Marks: 85**

**Answer FIVE questions, choosing ONE from each Unit.**

**All questions carry equal marks.**

**UNIT-I**

1. Write in detail about the classification of silicate minerals with neat sketches?

**OR**

2. Answer any two of the following:
- a) Structure of olivine group of minerals
  - b) Chemistry of garnet group of minerals
  - c) Optical properties of kyanite and sillimanite

**UNIT-II**

3. Describe the structure, chemistry and optical properties of pyroxene group of minerals

**OR**

4. Answer any two of the following:
- a) Di-Octahedral micas
  - b) Smectite group
  - c) Chemistry of amphiboles

**UNIT-III**

5. Write the classification of the feldspar group of minerals and add a note on its twinning?

**OR**

6. Answer any two of the following:
- a) Classification of Feldspathoids
  - b) Structure of quartz, trydamite and crystobalite.
  - c) Isomorphism

**UNIT-IV**

7. Write in detail about chemistry and paragenesis of the Sulphide group of minerals?

**OR**

8. Answer any two of the following:
- a) Classification of non-silicates
  - b) Physical properties of Native metallic elements
  - c) Spinel group of minerals

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## SYLLABUS

### M.S. GEOLOGY (5 YEAR INTEGRATED COURSE)

#### PAPER – II; IGNEOUS AND METAMORPHIC PETROLOGY

#### VII - SEMESTER

##### **UNIT – I**

Magma generation, Primary and modified magmas. Mantle Xenoliths.. Differentiation and assimilation of magmas, Magma mixing. Plate tectonics in relation to petrology.

##### **UNIT – II**

Bowen's reaction series, phase equilibrium of single, binary and ternary silicate systems and crystallisation in the light of experimental works and petrogenetic importance. Criteria for classification of igneous rocks. Textural, mineralogical and chemical classification. Norm (CIPW) and Niggli values. Classification using multiple criteria, IUGS classifications.

##### **UNIT – III**

Petrographic provinces and associations. Mineralogy, texture and patrogenesis of major igneous rock types such as granites, Basalts, ultramafic rocks, carbonotites, Lamprophyres syenites, & Nepheline syenites.

##### **UNIT – IV**

Metamorphic textures and structures. Recrystallisation, metamorphic differentiation, metamorphic condition, mineralogies and protoliths. Metamorphic phase diagrams – ACF, AKF and AFM, metamorphic facies with special reference to Indian Examples.

#### ASSIGNMENTS

Nature of metamorphic reactions. Pressure – temperature conditions of metamorphism. Anatexis and origin of migmatites. Regional metamorphism and paired metamorphic belts. P-T-t paths.

#### PRACTICALS:

- a) Megascopic and microscopic study of igneous rocks.
- b) Calculation of CIPW norms. Preparation of variation diagrams.
- c) Megascopic and microscopic study of metamorphic rocks.
- d) Construction of ACF – AKF – AFM diagrams.
- e) Geothermobarometric calculations.

**(P.T.O)**

**TEXT BOOKS:**

Philpots A., 1992. Igneous and metamorphic petrology.

Best, M.G., 1986. Igneous and metamorphic petrology.

Yardley, B.W., 1989. An introduction to metamorphic petrology.

Raymond, L.A., 1995. Petrology.

Middlemost – Magmas and Magmatic rocks.

Turner & Verhoogom – Igneous & Metamorphic petrology.

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**Model Question Paper**  
**M.S. Geology (5 Year Integrated Course), Paper - II**  
**Igneous and Metamorphic Petrology, VII - Semester**  
(Effective from the Admitted Batch of 2011-2012)

**Time: 3Hrs**

**Max. Marks: 85**

**Answer FIVE questions, choosing ONE from each Unit.**

**All questions carry equal marks.**

**UNIT-I**

1. Discuss about differentiation and Assimilation of Magmas.

**OR**

2. Write notes on any THREE of the following:

- |                                   |                                 |
|-----------------------------------|---------------------------------|
| a) Mantle xenoliths.              | b) Primary and modified magmas. |
| c) Lithosphere and Asthenosphere. | d) Magma mixing.                |

**UNIT-II**

3. Write on phase equilibrium of single, binary and ternary systems crystallisation.

**OR**

4. Write notes on any THREE of the following:

- a) Textural classification of igneous rocks.
- b) Mineralogical classification of igneous rocks.
- c) Role of volatiles in Crystallisation.
- d) Norm – CIPW.

**UNIT-III**

5. Describe the mineralogy, texture and petrogenesis of ultramafic rocks.

**OR**

6. Answer any THREE of the following:

- |                                             |                    |
|---------------------------------------------|--------------------|
| a) Petrographic provinces and associations. | b) Basalts.        |
| c) Granites.                                | d) Alkaline rocks. |

**UNIT-IV**

7. Write an essay on metamorphic facies concept. Give in detail about different metamorphic facies with examples.

**OR**

8. Answer any THREE of the following:

- |                            |                        |
|----------------------------|------------------------|
| a) Metamorphic structures. | b) ACF – AFM diagrams. |
| c) Recrystallisation.      | d) Protoliths.         |

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## **SYLLABUS**

### **M.S. GEOLOGY (5 YEAR INTEGRATED COURSE)**

### **PAPER- III, STRUCTURAL GEOLOGY & TECTONICS**

#### **VII - SEMESTER**

##### **UNIT – I**

Mechanical principles and properties of rocks and their controlling forces. Concept of stress and strain. Composition and resolution of forces. Principles of failure by rupture relation of rupture to strain. Two dimensional strain and stress analysis. Types of strain ellipses and ellipsoids, their properties and geological significance.

##### **UNIT – II**

Folds and their classification. Mechanics and causes of folding. Determination of top of beds by primary features.

##### **UNIT – III**

Fractures and Joints. Nomenclature, origin, significance and classification of faults. Causes and dynamics of faulting, strike slip faults, normal faults, overthrust and nappe etc.

##### **UNIT – IV**

Concept of petrofabrics and symmetry. Field and laboratory techniques. Stereographic treatment, Types of fabrics, fabric elements.

#### **ASSIGNMENTS**

Plate tectonics, Dynamic evolution of continental and oceanic crust, Tectonics of Precambrian Orogenic Belts of India. Formation of Mountain roots. Anatomy of orogenic belts with case examples such as Alpine Himalayan, the Andes etc.

#### **PRACTICALS:**

- a) Preparation and interpretation of geological maps and sections.
- b) Structural problems concerning to economic mineral deposits.
- c) Recording and plotting of field data.
- d) Plotting and interpretation of petrofabric data on the stereographic nets.

(P.TO)

**TEXT BOOKS:**

- 1) Structural Geology by M.P. Billings.
- 2) Structural Geology and Tectonic Principles by P.C. Badgley.
- 3) Principles of Physical Geology by A. Holmes and D. L. Holmes.
- 4) Aspects of Tectonics focus on South Central India by K.S. Validya.
- 5) An outline of structural Geology by Bruce E. Hobbs.

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**Model Question Paper**  
**Structural Geology & Tectonics, VII - Semester**  
**M.S. Geology (5 Year Integrated Course), Paper - III**  
(Effective from the Admitted Batch of 2011-2012)

**Time: 3Hrs**

**Max. Marks: 85**

**Answer FIVE questions, choosing ONE from each Unit.**

**All questions carry equal marks.**

**UNIT-I**

1. Define stress and strain. Explain how rocks behave under these conditions.

**OR**

2. Answer any TWO of the following:

a) Boudinage structures

b) Deformation mechanisms

c) Mechanical properties of rocks

**UNIT-II**

3. Describe the different types of fold

**OR**

4. Answer any TWO of the following:

a) Dome

b) Basins

c) Mechanics of folding

**UNIT-III**

5. Describe the criteria by which faults are recognized.

**OR**

6. Answer any TWO of the following:

a) Slickenside

b) Columnar Joints

c) Nappe

**UNIT-IV**

7. Discuss the concept of petrofabrics and symmetry.

**OR**

8. Answer any TWO of the following:

a) Tectonite

b) Equal area net

c) Planar and linear structures

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## SYLLABUS

### M.S. GEOLOGY (5 YEAR INTEGRATED COURSE)

#### PAPER- IV; STRATIGRAPHY AND MICROPALAEONTOLOGY

##### VII - SEMESTER

###### **UNIT – I**

Importance and principles of stratigraphy, geological time scale, Hutton's uniformitarianism – controls and development of stratigraphic record, Litho stratigraphy, correlation and stratigraphic code.

###### **UNIT – II**

Bio stratigraphy: Review of current trends, Zonation and time significance. Magneto stratigraphy, Cyclostratigraphy and Event stratigraphy.

###### **UNIT – III**

Seismicstratigraphy and Sequence stratigraphy geochronology and Chronostratigraphy Chemostratigraphy, Completeness and incompleteness of stratigraphic records.

###### **UNIT – IV**

Introduction and advances in Micropalaeontology. Kingdoms of life. Stratigraphic distribution of major microfossil groups. Collection, separation and mounting of microfossils from surface and sub-surface sediments. Morphology, Ecology distribution and outline classification of Foraminifera. Role of Foraminifera in hydrocarbon exploration and Monitoring Coastal pollution.

##### ASSIGNMENTS

Elementary ideas about the major morphological groups of Ostracoda, Radiolaria, Coccolithophores/ Calcareous Nannoplankton, pollen and spores and their stratigraphic and paleoecological significance Stable Isotopes and palaeoclimates. Taphonomy and paleobiogeography.

##### PRACTICALS:

Processing and preparation of samples for Microscopic study. Identification of selected fossils/species of Foraminifera, Ostracoda and Radiolaria under stereo binocular Microscope with CCTV. Study of Important microfossils from stratigraphic formations of India. Study of SEM photographs of microfossils. Construction of Biostratigraphic range charts and paleoenvironmental analysis of well sections. Preparation of different stratigraphic distribution maps of India. Study of paleogeographic Maps.

(P.T.O)

**TEXT BOOKS:**

- 1) Doyle, P and Bennet, M.R., 1996; Unlocking the stratigraphic Record. John Wiley.
- 2) Boggs, Sam JR; 1995; Principles of sedimentology and stratigraphy Prentice Hall.
- 3) Brenner, R.E and MC Hargue, T.R; 1988; Integrative Stratigraphy Concepts and applications Prentice Hall.
- 4) Prothero, D.R. 1988; Bringing fossils to life. An Introduction to palaeobiology. MC grew Hill.
- 5) Stratigraphic principles and practice, 1960. J. Marwin Weller. Harper and Row Publisher.
- 6) Haq, B.U and Boersma, A. 1978; Introduction to Marine Micropaleontology, Elsevier.

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**Model Question Paper**  
**Stratigraphy & Micropaleontology, VII - Semester**  
**M.S. Geology (5 Year Integrated Course) Paper - IV**  
(Effective from the Admitted Batch of 2011-2012)

**Time: 3Hrs**

**Max. Marks: 85**

**Answer FIVE questions, choosing ONE from each Unit.**

**All questions carry equal marks.**

**UNIT-I**

1. Write an essay on principle of correlation.
- OR**
2. Answer any TWO of the following
    - a) Uniformitarianism.
    - b) Geologic time scale.
    - c) Lithostratigraphy.

**UNIT-II**

3. Write an essay on cyclostratigraphy and event stratigraphy.
- OR**
4. Answer any TWO of the following
    - a) Zonation.
    - b) Magnetostratigraphy.
    - c) Biostratigraphy.

**UNIT-III**

5. Discuss about seismic stratigraphy and sequence stratigraphy.
- OR**
6. Answer any TWO of the following:
    - a) Completeness of stratigraphic records.
    - b) Geochronology.
    - c) Chemostratigraphic correlation.

**UNIT-IV**

7. Write about morphology, ecology, distribution and outline classification of Foraminifera.
- OR**
8. Answer any TWO of the following:
    - a) Stratigraphic distribution of major micro fossil groups.
    - b) Role of Foraminifera in hydrocarbon exploration.
    - c) Methods of Collection and Separation of Microfossils.

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